Table 1. Demographic characteristics of the non-binary sample. (Table view)**Table 2**. History and interest in medical gender affirmation. (Table view)**Table 3**. Met and unmet need for medical gender affirmation. (Table view)

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Met and unmet need for medical gender affirmation in the Australian non-binary community

Sav Zwickl[a]

, Tomi Rugglesa

, Stephanie Sheahanb , Joel Murrayc

, Julian Gracea

, Ariel Gingera , Alex Fang Qi Wonga

, and Ada S. Cheunga ,d

[a] Trans Health Research Group, Department of Medicine (Austin Health), The University of Melbourne, Melbourne, Victoria, Australia[b] Department of Anatomy and Physiology, The University of Melbourne, Melbourne, Victoria, Australia[c] Neophile, Sydney, New South Wales, Australia[d] Gender Clinic, Department of Endocrinology, Austin Health, Melbourne, Victoria, Australia

Abstract

Background: There is a widely held assumption that non-binary people do not, or rarely, pursue gender-affirming hormone therapy (GAHT) or gender-affirming surgery (GAS), however, little is known about the medical gender affirmation needs of non-binary people in Australia.
Aim: This study aimed to assess the rates of met and unmet need for GAHT and GAS amongst a community sample of non-binary people in Australia.
Methods: This online, cross-sectional survey was open to non-binary people, living in Australia and aged ≥16 years between 11 June 2021 and 21 April 2022. Survey questions assessed history of and desire for GAHT and GAS.
Outcomes: The main outcome measures were rates and types of GAHT and GAS that were desired and accessed.
Results: Of 271 non-binary respondents, 80.4% were presumed female at birth (PFAB) and 19.6% were presumed male at birth (PMAB). Respondents ranged from 16–68 years of age, with a median age of 28 years (IQR 23, 34). In respondents PFAB, there was 63.1% total need for GAHT, and in those respondents who reported need for GAHT, the rate of unmet need was 8.8%. Over half of respondents PFAB reported need for GAS (52.8%) and in those respondents, the rate of unmet need was 43.4%. In respondents PMAB, there was 77.3% total need for GAHT, and in those respondents who reported need for GAHT, the rate of unmet need was 14.6%. One third of respondents PMAB (32.1%) reported need for GAS, and in those respondents, the rate of unmet need was 82.4%.
Conclusion: Given the frequency with which non-binary people desire and access medical gender-affirmation, healthcare professionals urgently require additional training, to increase awareness about the variety of medical affirmation options and how to provide good quality, patient-centred care to improve psychological functioning and quality of life for non-binary people.

Keywords
Gender-affirming hormones, gender-affirming surgery, genderqueer, non-binary, transgender

Contact Ada S. Cheung adac@unimelb.edu.au Austin Health, 145 Studley Road, Heidelberg, Victoria, Australia.

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their consent.

Introduction

Non-binary is an umbrella term for individuals who have a gender that does not fit exclusively into the woman/man gender binary. Internationally, it has been estimated that 1.8%–4.6% of the general population (Kaltiala-Heino & Lindberg, 2019; Kuyper & Wijsen, 2014; Van Caenegem *et al.*, 2015; White *et al.*, 2018) and 25.6%–53.5% of the trans and gender diverse community (Bretherton *et al.*, 2021; Callander *et al.*, 2020; Hill *et al.*, 2020; Hill *et al.*, 2021; Zwickl *et al.*, 2023) have a non-binary gender identity.

There is a common perception that non-binary people rarely pursue medical gender affirmation (Vincent, 2020), however, akin to trans men and trans women, some non-binary people desire gender-affirming hormone therapy (GAHT) and/or gender-affirming surgeries (GAS) to alleviate gender dysphoria or gender incongruence. Non-binary people presumed female at birth (PFAB) may use testosterone GAHT to induce physical changes including an increase in body hair, deepening of the voice, enlargement of the clitoris, cessation of menses, an increase in lean body mass and upper body strength with an accompanying decrease in body fat, and a decrease in the hip-to-waist ratio (Cheung *et al.*, 2019; Coleman *et al.*, 2022). Non-binary people presumed male at birth (PMAB) may use estradiol, often in combination with anti-androgens, to produce skin softening, a reduction in facial hair growth, redistribution of fat to the hips and buttocks, and breast development (Cheung *et al.*, 2019; Coleman *et al.*, 2022). Non-binary people may also have varying desires for GAS, including of the chest (e.g. breast reduction, double mastectomy, or breast augmentation), face (e.g. facial masculinization, facial feminization), and genitals (e.g. phalloplasty, vaginoplasty).

Of the few studies that have explored desire and access to medical gender affirmation in non-binary populations, there are

consistently high rates of unmet need for both GAHT and GAS (Hill *et al.*, 2020; Hyde *et al.*, 2013; Kennis *et al.*, 2022; Puckett *et al.*, 2017; Veale *et al.*, 2019). For example, in a large community sample of non-binary adults in the United States ($n = 9769$), 13% of respondents had ever used GAHT, however, an additional 49% wanted GAHT (James *et al.*, 2016).

Within Australia, the limited research suggests that total need for GAHT remains consistent (approximately half of each sample), while the rate of non-binary people accessing GAHT (met need) may be on the rise. A 2013 community sample of 232 non-binary adults living in Australia indicated 51.3% total need for GAHT, with 17.7% of respondents currently using GAHT, 5.6% reporting previous use though not wanting or unsure about future use, 4.3% reporting previous use and desire to reinitiate GAHT, and 23.7% reporting never having used but wanting GAHT (Hyde *et al.*, 2013). In a more recent Australian survey of 921 non-binary people conducted in 2019, there was 50.1% total need for GAHT, with 22.2% of respondents currently using GAHT, 4.9% reporting previous but not current use, and 23% reporting desire for GAHT (Hill *et al.*, 2020).

In terms of GAS, the literature consistently indicates that unmet need exceeds met need for all types of surgeries in non-binary populations globally (Hyde *et al.*, 2013; James *et al.*, 2016; Kennis et al., 2022; Puckett *et al.*, 2017; Tristani-Firouzi *et al.*, 2022; Veale *et al.*, 2019). In the only known Australian study to explore access to GAS in non-binary adults, rates of unmet need exceeded met need across all surgery types. This included chest surgery (6.6% met need; 49.3% unmet need), and hysterectomy (0.7% met need; 21.3% unmet need) in respondents PFAB, and breast enlargement (1% met need; 31.3% unmet need), and facial feminization (4.2% met need; 31.3% unmet need) in respondents PMAB (Hyde *et al.*, 2013).

For those who desire it, access to GAHT and GAS have been shown to decrease depression, self-harm, suicidality and gender dysphoria, and improve quality of life (Hembree *et al.*, 2017; Nolan

et al., 2023; Olson-Kennedy & Warus, 2017; Pullen Sansfaçon *et al.*, 2023). Unmet need for medical affirmation has been linked to suicidality; wanting but not having had GAS has been associated with higher odds of lifetime suicide attempt (Zwickl *et al.*, 2021) and delays to GAS during the COVID-19 pandemic were associated with higher odds of thoughts of self-harm or suicide (Zwickl *et al.*, 2023).

Given the limited research into non-binary access and desire for medical gender affirmation, and the rapidly changing nature of trans and gender diverse communities and healthcare, the rates of met and unmet need for GAHT and/or GAS in non-binary people remains unclear (Coleman *et al.*, 2022). Therefore, we aimed to explore the rates of met and unmet need for GAHT and GAS among a community sample of non-binary people in Australia. Due to the increasing visibility of non-binary medical gender affirmation and improvements in access to healthcare, we hypothesized that total need for GAHT and GAS would be higher in this sample compared to previous Australian non-binary samples. Due to changes to best-practice models of care, there has been a shift toward patient-centered individualized approaches to prescribing GAHT *(Australian informed consent standards of care for gender affirming hormone therapy, 2022; Cheung et al., 2019; Cundill & Wiggins, 2017; Protocols for the initiation of hormone therapy for trans & gender diverse patients, 2020),* we hypothesized lowered rates of unmet need for GAHT compared to previous Australian non-binary samples. However, given ongoing barriers to accessing surgery in Australia, we anticipated high rates of unmet need for GAS.

Materials and methods

Respondents for this online cross-sectional survey were recruited from among the participants in *TRANSform*, an ongoing longitudinal Australian trans health survey-based study, launched in May 2020. *TRANSform* participants—people aged 16 years or more, currently

living in Australia, and with a gender different to their sex as recorded at birth—were recruited by non-probability snowball sampling with recruitment calls posted on social media and *via* trans and gender diverse community support groups and organizations in Australia.

TRANSform participants complete an enrollment survey that collects basic demographic information and an email address and are then invited by email to participate in two or three sub-studies each year. The survey reported in this paper was implemented as the new *TRANSform* enrollment survey on 11 June 2021 (replacing a previous version in use between 1 May 2020 − 11 June 2021). At this time, existing *TRANSform* participants were invited in emails including an individualized link to complete the online survey. From 11 June 2021, all participants recruited for *TRANSform*, completed this enrollment survey on entry into the longitudinal study. The data reported in this article was collected between11 June 2021 and 21 April 2022. Written informed consent was not obtained, however the survey preamble outlined that completing the survey implied consent.

The survey was designed collaboratively by our core team of researchers who are members of the Australian trans and gender diverse community, and a research advisory group of trans and gender diverse community members, along with clinicians experienced in trans healthcare. Survey data were collected and managed using REDCap electronic data capture tools hosted at The University of Melbourne. The study received ethical and governance approval by the Austin Health Human Research Ethics Committee (Reference Number HREC/57155/Austin-2019), ACON Research Ethics Review Committee (Reference Number 2020/03) and the Thorne Harbor Health Community Research Endorsement Panel (Reference Number THH/CREP 20-006).

Demographic information collected from survey respondents included date of birth, country of birth, Aboriginal or Torres Strait Islander status, variation of sex characteristics (intersex), and state/

territory and postcode of residency. To determine gender identity, respondents were asked 'Which group best reflects your gender?' from four fixed-response options: man/trans man, woman/trans woman, non-binary or gender diverse (including agender), and a culturally specific identity not captured by other available options.

Respondents were also asked about their sex presumed at birth. We acknowledge that stratification of respondents by sex presumed at birth can shift the focus from gender toward sex in a way that can undermine non-binary identities and experiences. Simultaneously, we recognize that sex presumed at birth impacts medical affirmation methods and the social context in which they are accessed. The significantly higher numbers of respondents PFAB in this study compared to PMAB also highlights the need for this data stratification.

History of and desire for GAHT and GAS were assessed through fixed-option responses to 'Have you *ever* taken gender-affirming hormone therapy? This includes people who take hormones intermittently or micro-dose, puberty blockers, and performance enhancers used for gender-affirmation?', and 'Have you had any gender-affirming surgery in the past?'.

Respondents who indicated current GAHT use, were also asked to provide a fixed-option response to 'What gender-affirming hormone therapy are you *currently* taking?'. Respondents who indicated a history of surgery, were asked to provide a fixed-option response to 'What kind of gender-affirming surgery have you had in the past?'.

To explore met and unmet need, survey responses indicating having ever used GAHT were categorized as 'met need' for GAHT and 'taking steps to commence GAHT' was categorized as 'unmet need' for GAHT. Similarly, responses indicating history of one or more GAS were categorized as 'met need' and 'taking steps to have GAS' was categorized as unmet need for GAS. Participant characteristics are reported as frequency (percentage) for categorical variables, and median (standard deviation), or median (interquartile

range) as appropriate for not normally distributed data.

Results

Of 1023 valid survey responses, 282 (27.6%) were 'non-binary or gender diverse (including agender)' (herein, *non-binary*). For the purposes of this analysis, those non-binary respondents who did not indicate their sex presumed to be at birth ($n = 11$) were excluded from analysis, leaving a total of 271 eligible responses.

Sample demographics

Of 271 respondents, 218 (80.4%) were PFAB, 53 (19.6%) were PMAB, and they ranged from 16–68 years of age, with a median age of 28 years (IQR 23,34). For more detailed demographic characteristics, see Table 1.

Demographic Variable	N	%
Age (years) ($N = 268$)		
16–25	106	39.6
26–35	111	41.4
36–45	35	13.1
46–55	12	4.5
56+	4	1.5
Sex presumed at birth ($N = 271$)		
Female	218	80.4
Male	53	19.6
Variation of sex characteristics (Intersex) ($N = 271$)		
No	227	83.8
Yes	3	1.1
Unsure	40	14.8
Prefer not to say	1	0.4
Aboriginal or Torres Strait Islander ($N = 271$)		

Aboriginal	3	1.1
Torres Strait Islander	0	0.0
Aboriginal and Torres Strait Islander	0	0.0
Non-Indigenous	262	96.7
Unsure	5	1.8
Prefer not to say	1	0.4
Australian state or territory ($N = 271$)		
Australian Capital Territory	11	4.1
New South Wales	66	24.4
Northern Territory	4	1.5
Queensland	32	11.8
South Australia	16	5.9
Tasmania	6	2.2
Victoria	106	39.1
Western Australia	30	11.1

Medical gender affirmation

In this non-binary sample, there was 65.9% ($n = 178$) total need for GAHT (respondents who had ever used or were taking steps to commence GAHT), and 48.7% ($n = 130$) total need for GAS (history of or taking steps to have GAS). There was 44.0% ($n = 117$) total need for *both* GAHT and GAS amongst respondents (Table 2).

Affirmation Variable	PFAB N (%)	PMAB N (%)	Total sample N (%)
History/Interest in GAHT ($N = 270$)			
Currently using GAHT	106 (48.8)	31 (58.5)	137 (50.7)
Previously but not currently using GAHT	19 (8.8)	4 (7.5)	23 (8.5)
Taking steps to commence	12 (5.5)	6 (11.3)	18 (6.7)

GAHT			
Thinking about whether GAHT is right for them	46 (21.2)	9 (17.0)	55 (20.4)
No interest in GAHT	33 (15.2)	3 (5.7)	36 (13.3)
Type of GAHT ($N = 271$)*			
Testosterone	105 (48.2)	0 (0.0)	105 (38.7)
Estrogen	1 (0.5)	30 (56.6)	31 (11.4)
Anti-Androgens (testosterone blockers)	0 (0.0)	20 (37.7)	20 (7.4)
Progesterone	0 (0.0)	8 (15.1)	8 (3.0)
Puberty blockers	0 (0.0)	0 (0.0)	0 (0.0)
Other (e.g. Performance enhancers)	3 (1.4)	0 (0.0)	3 (1.1)
History/Interest in GAS ($N = 267$)			
Had one or more GAS	64 (29.9)	3 (5.7)	67 (25.1)
Taking steps to have GAS	49 (22.9)	14 (26.4)	63 (23.6)
Thinking about whether GAS is right for them	64 (29.9)	25 (47.2)	89 (33.3)
No interest in GAS	37 (17.3)	11 (20.8)	48 (18.0)
Type of surgery ($N = 271$)*			
Body feminization	0 (0.0)	0 (0.0)	0 (0.0)
Body masculinization	0 (0.0)	0 (0.0)	0 (0.0)
Breast augmentation	0 (0.0)	0 (0.0)	0 (0.0)
Breast reduction	1 (0.5)	0 (0.0)	1 (0.4)
Double mastectomy	60 (27.5)	0 (0.0)	60 (22.1)

Facial feminization	0 (0.0)	0 (0.0)	0 (0.0)
Facial masculinization	0 (0.0)	0 (0.0)	0 (0.0)
Hysterectomy	7 (3.2)	0 (0.0)	7 (2.6)
Metoidioplasty	0 (0.0)	0 (0.0)	0 (0.0)
Oophorectomy	4 (1.8)	0 (0.0)	4 (1.5)
Orchiectomy	0 (0.0)	2 (3.8)	2 (0.7)
Phalloplasty	0 (0.0)	0 (0.0)	0 (0.0)
Tracheal shave	0 (0.0)	0 (0.0)	0 (0.0)
Vaginoplasty	0 (0.0)	1 (1.9)	1 (0.4)
Voice surgery	0 (0.0)	0 (0.0)	0 (0.0)
Other	1 (0.5)	1 (1.9)	2 (0.7)
History/interest in GAHT and/or GAS ($N = 266$)			
Have or want both GAHT and GAS	102 (47.9)	15 (28.3)	117 (44.0)
Have or want GAHT, considering GAS	27 (12.7)	20 (37.7)	47 (17.7)
Have or want GAHT, no interest in GAS	9 (4.2)	6 (11.3)	15 (5.6)
Considering GAHT, have or want GAS	4 (1.9)	1 (1.9)	5 (1.9)
Considering GAHT, considering GAS	29 (13.6)	5 (9.4)	34 (12.8)
Considering GAHT, no interest in GAS	10 (4.7)	3 (5.7)	13 (4.9)
No interest in GAHT, have or want GAS	6 (2.8)	1 (1.9)	7 (2.6)
No interest in GAHT, considering GAS	8 (3.8)	0 (0.0)	8 (3.0)

No interest in GAHT, no interest in GAS	18 (8.5)	2 (3.8)	20 (7.5)

PFAB – presumed female at birth; PMAB – presumed male at birth; GAHT – gender-affirming hormone therapy; GAS – gender-affirming surgery; 'Unsure' and 'prefer not to say' responses not included;

*Multiple responses allowed for this question so total responses do not sum to 100%.

In respondents PFAB, there was 63.1% ($n = 137$) total need for GAHT; 48.8% ($n = 106$) reported current use of GAHT, 8.8% ($n = 19$) reported previous but not current use of GAHT and 5.5% ($n = 12$) were taking steps to commence GAHT (Table 2). Amongst those 137 respondents who reported need for GAHT, the rate of unmet need was 8.8% ($n = 12$) (Table 3). Testosterone GAHT use was reported by all but one of those respondents PFAB currently using GAHT.

Affirmation Variable	PFAB N (%)	PMAB N (%)	Total sample N (%)
Need for GAHT ($N = 178$)			
Met need (have ever used GAHT)	125 (91.2)	35 (85.4)	160 (89.9)
Unmet need (taking steps to commence GAHT)	12 (8.8)	6 (14.6)	18 (10.1)
Need for GAS ($N = 130$)			
Met need (have had one or more GAS)	64 (56.6)	3 (17.6)	67 (51.5)
Unmet need (taking steps to have GAS)	49 (43.4)	14 (82.4)	63 (48.5)

PFAB – presumed female at birth; PMAB – presumed male at birth; GAHT – gender-affirming hormone therapy; GAS – gender-affirming surgery.

There was 52.8% ($n = 113$) total need for GAS in respondents PFAB; 29.9% ($n = 64$) reported history of one or more GAS, and 22.9% ($n = 49$) reported taking steps to have GAS. Amongst those 113 respondents who reported need for GAS, the rate of unmet need was 43.4% ($n = 49$) (Table 3). The most common types of GAS accessed by respondents PFAB were double mastectomy (27.5%, $n = 60$), hysterectomy (3.2%, $n = 7$) and oophorectomy (1.8%, $n = 4$). Need for *both* GAHT and GAS was reported by 47.9% ($n = 102$) of respondents PFAB (Table 2).

In respondents PMAB, there was 77.3% ($n = 41$) total need for GAHT; 58.5% ($n = 31$) reported current use of GAHT, 7.5% ($n = 4$) reported previous but not current use of GAHT, and 11.3% ($n = 6$) were taking steps to commence GAHT. Amongst those 41 respondents who reported need for GAHT, the rate of unmet need was 14.6% ($n = 6$) (Table 3). Estrogen was the most commonly used type of GAHT (56.6%, $n = 30$), followed by anti-androgens (37.7%, $n = 20$) and progesterone (15.1%, $n = 8$) (Table 2).

There was 32.1% ($n = 17$) total need for GAS in respondents PMAB; 5.7% ($n = 3$) reported history of one or more GAS, and 26.4% ($n = 14$) were taking steps to have GAS. Amongst those 17 respondents who reported need for GAS, the rate of unmet need was 82.4% ($n = 14$) (Table 3). The most common types of GAS accessed by respondents PMAB were orchiectomy (3.8%, $n = 2$), vaginoplasty (1.9%, $n = 1$), and zero-depth labioplasty (1.9%, $n = 1$). Need for *both* GAHT and GAS was reported by 28.3% ($n = 15$) of respondents PMAB (Table 2).

Discussion

In this cross-sectional community survey of 271 non-binary people, history of or desire for medical gender affirmation was

common. Contrary to the widely held perception that non-binary people rarely pursue medical affirmation (Vincent, 2020), in this sample of non-binary Australians, there was 65.9% total need for GAHT (59.2% had ever used GAHT; 6.7% were taking steps to commence GAHT), 48.7% total need for GAS (25.1% had one or more GAS; 23.6% were taking steps to have GAS), and 44% total need for *both* GAHT and GAS. While unmet need for GAHT was relatively low (6.7% reported 'taking steps to commence GAHT'), nearly one in four (23.6%) respondents reported unmet need for GAS.

Gender-affirming hormone therapy in non-binary populations

Consistent with our hypothesis, the 65.9% total need for GAHT in non-binary respondents in this survey was higher than the rates reported in previous Australian samples by Hyde *et al.* (2013) (51.3%) and Hill *et al.* (2020) (50.1%). In respondents PFAB, 63.1% reported access to or desire for GAHT, with testosterone used by all but one of those respondents reporting current use of GAHT. In respondents PMAB, a majority (77.3%) reported access to or desire for GAHT, with estrogen the most common type of GAHT (56.6%), followed by anti-androgens (37.7%) and progesterone (15.1%). Additionally, respondents to this survey reported lower rates of unmet need for GAHT (6.7% of total sample; 10.1% of total need), compared to the previous Australia samples by Hyde *et al.* (2013) (28% of total sample; 55.9% of total need) and Hill *et al.* (2020) (23% of total sample; 46.6% of total need).

While some non-binary people access GAHT doses that are typically associated with trans men or trans women (*Australian informed consent standards of care for gender affirming hormone therapy*, 2022; Coleman *et al.*, 2022), others desire alternative approaches. Some non-binary people use GAHT for shorter periods of time to achieve their gender affirmation goals, with 8.5% of

respondents in this study reporting previous but not current use of GAHT while still identifying as non-binary. Use of lower doses of GAHT to induce slower physical changes is also common, with one study finding that 11% of non-binary respondents used low-dose GAHT, compared to 4.7% of trans people with a binary gender (Van Dijken *et al.*, 2021). Some non-binary people PMAB who do not desire breast growth may use selective estrogen receptor modulators (SERMs), however, there is no current literature supporting the benefits (or harms) of SERMs for non-binary people PMAB (Xu *et al.*, 2021).

Gender-affirming surgery in non-binary populations

Over half (52.8%) of survey respondents PFAB reported access to or desire for GAS. Although desire for GAS by type of surgery was not explored in this study, previous research has consistently demonstrated that chest surgery is the most desired and accessed type of GAS in trans and gender diverse people PFAB (Hyde *et al.*, 2013; James *et al.*, 2016; Tristani-Firouzi *et al.*, 2022; Veale *et al.*, 2019). While some non-binary people PFAB desire construction of a typically masculine chest, others may seek alternative surgical outcomes, such as atypical incision or nipple placement, complete removal of the nipples, or a non-flat chest (McTernan *et al.*, 2020).

Like with GAHT, this study also indicates an increase in access to GAS by non-binary people over the past decade, with 28% of survey respondents PFAB reporting chest surgery, a rate four times higher than the 6.6% reported by Hyde *et al.* (2013). Notably, however, unmet need for GAS remains high; in those respondents PFAB who reported need for GAS, the rate of unmet need was 43.4%. No survey respondents reported history of metoidioplasty or phalloplasty, a finding that is consistent with low rates of access to genital surgery observed in other non-binary samples (Hyde *et al.*, 2013; James *et al.*, 2016; Tristani-Firouzi *et al.*, 2022; Veale *et al.*, 2019). Previous studies have demonstrated varied rates of need for

genital surgeries in non-binary people PFAB. For example, in the Australian Hyde *et al.* (2013) sample, no respondents reported having had metoidioplasty or phalloplasty, however, 7.4% and 5.2% desired those surgeries, respectively. By comparison, James *et al.* (2016) reported that 4% had and 24% of their respondents wanted metoidioplasty, and 2% had and 19% wanted phalloplasty, indicative of higher rates of access to genital surgeries in the United States.

Just under one third (32.1%) of survey respondents PMAB reported history of or desire for GAS. However, unmet need for GAS was even higher than that observed in respondents PFAB; amongst respondents PMAB who reported need for GAS, the rate of unmet need was 82.4%. Only three respondents PMAB reported a history of GAS; 3.8% reported orchiectomy, 1.9% reported vaginoplasty and 1.9% reported zero-depth labioplasty. These rates of access to genital GAS are comparable to the 0%–3.7% of non-binary people PMAB who reported genital/gonadal surgeries in other studies (Hyde *et al.*, 2013; James *et al.*, 2016; Veale *et al.*, 2019). In this study, no respondents PMAB reported history of facial or body feminization surgery, breast augmentation, tracheal shave, or voice surgery. However, in other studies, 1.0%–8.0% of non-binary respondents PMAB reported facial feminization surgery (Hyde *et al.*, 2013; James *et al.*, 2016; Tristani-Firouzi *et al.*, 2022) and 0.0%–5.0% reported breast augmentation (Hyde *et al.*, 2013; James *et al.*, 2016; Tristani-Firouzi *et al.*, 2022; Veale *et al.*, 2019). Although desire for GAS was not explored by surgery type in this study, previous research demonstrates high rates of unmet need across various surgery types in non-binary people PMAB. For example, in the Hyde *et al.* (2013) Australian sample, unmet need was highest for breast enlargement (31.3%) and facial feminization (31.3%), followed by vaginoplasty (21.9%) and orchidectomy (17.7%).

Some non-binary people PMAB may desire different GAS variations, including depthless labiaplasties, orchidectomy without intent to receive vaginoplasty, or vaginoplasty procedures which

preserve the penis (Vincent, 2018). Sexual function as well as the gender and sexuality of the sexual partners a person desires, may contribute to lower rates of GAS among non-binary people PMAB (Callander *et al.*, 2019).

Access to medical gender affirmation

Historically, access to gender-affirming medical treatments has been provided or denied based on rigid and binary notions of 'acceptable' gendered bodies and gender norms (Aizura, 2018). Treatment guidelines for the healthcare of trans people who seek to affirm their gender with GAHT and GAS have often relied on self-identification with a binary gender identity. For example, the DSM-IV, pathological definitions were utilized as part of routine screening for accessing GAHT and GAS, including a definition of "Gender Identity Disorder" which relied on "a strong and persistent cross-gender identification" (American Psychiatric Association, 2000).

The non-binary community has, therefore, experienced significant barriers to accessing gender-affirming care (Clark et al., 2018; James *et al.*, 2016). Due to some clinician's unwillingness to prescribe GAHT to non-binary people, non-binary individuals have reported presenting as trans men or trans women to healthcare professionals to access gender-affirming treatment (Bradford *et al.*, 2019; Taylor *et al.*, 2019). Some clinicians are unwilling to prescribe GAHT regimens intended for slower or less dramatic physical change, and some non-binary people report having to accept 'typical' GAHT doses that are not aligned with their transition goals (Haire *et al.*, 2021).

The higher rates of access and lower rates of unmet need for GAHT observed in this study, compared to previous Australian samples, is indicative of an improvement in access to GAHT in Australia in recent years. This improvement is likely reflective of a recent shift toward the depathologization of gender diversity, the increased recognition of non-binary identities and experiences, and

a move toward a patient-centered individualized approach to the prescription of GAHT. On an international level, this has included the publication of a statement on depathologization by the World Professional Association of Transgender Health in *The Standards of Care 7* (*SoC7*) (Coleman *et al.*, 2012), the diagnostic label change of Gender Identity Disorder to Gender Dysphoria and explicit recognition of non-binary identities and experiences in the *DSM-V* (American Psychiatric Association, 2013), and a change from Transsexualism to Gender Incongruence in the *ICD-11* (World Health Organization, 2019). Additionally, within Australia, the Informed Consent model of care for the initiation of GAHT has been increasingly adapted across primary and specialist healthcare settings, with a series of guidelines published since (*Australian informed consent standards of care for gender affirming hormone therapy*, 2022; Cheung *et al.*, 2019; Cundill & Wiggins, 2017; *Protocols for the initiation of hormone therapy for trans & gender diverse patients*, 2020).

However, despite the increase in non-binary visibility, many clinicians remain uninformed about the diverse gender-affirmation needs of non-binary people (Zwickl *et al.*, 2019), may be reluctant to utilize Informed Consent models of care (Bretherton *et al.*, 2019), and may assume that non-binary people do not need or want GAHT and/or GAS (Vincent, 2020).

Unlike the progress we have observed in terms of access to GAHT, requirements for access to GAS have changed little in forty years (Lane, 2018). Until relatively recently, it was uncommon for people to access GAS without using GAHT for a significant amount of time. Similarly, there have been and continue to be surgeons who are unwilling to perform surgeries that will produce 'non-typical' results. The increasingly willingness of some surgeons to perform GAS without GAHT and to provide 'non-typical' results such as removal of the nipples with chest surgery, has likely contributed to the increase in non-binary people accessing GAS in this study, compared to the previous Australian sample (Hyde *et al.*, 2013).

This is most notable for non-binary people PFAB accessing chest surgery.

However, at the time that this study was conducted, in line with the SoC7 (Coleman *et al.*, 2012), diagnosis of Gender Dysphoria was required for GAS in Australia, and 12 months of Real-Life Experience (where people live in a role congruent to their gender identity) was required before GAS (Monash Health, 2019). Therefore, non-binary people's access to GAS may have been impacted by practitioner perceptions of non-binary identities in surgery readiness assessments, particularly as assessment criteria were historically based around strict binary notions of gender (Travis *et al.*, 2022). Lower rates of access to all forms of GAS, but particularly genital GAS, may also be attributed to financial inaccessibility, surgeon unavailability, and high complication rates, but these barriers aren't specific to non-binary people. This nuance may be reflected in the different rates of unmet need between non-binary people PFAB and PMAB, with respondents PMAB reporting almost twice the rate of unmet need (82.4%) for GAS compared to PFAB respondents (43.4%).

Clinical implications

The lack of understanding of non-binary genders in healthcare and other social and institutional settings, likely contributes to the higher rates of mental ill-health seen in non-binary people compared to trans men and trans women (Cheung *et al.*, 2020; Zwickl *et al.*, 2023). For those people who desire GAS, obstructed access is associated with an increased risk of suicidality (Pullen Sansfaçon *et al.*, 2023; Zwickl *et al.*, 2023) and lifetime suicide attempts (Zwickl *et al.*, 2021), while access to gender affirming healthcare is associated with improvements in mental health and wellbeing and decreased self-harm and suicidality (Nolan *et al.*, 2023; Pullen Sansfaçon *et al.*, 2023). Therefore, there is an urgent need for more training for healthcare professionals to ensure that non-binary

people and all trans and gender diverse people have access to safe and timely gender-affirming healthcare.

Internationally, best practice standards of care recognize the diversity of non-binary people (Coleman *et al.*, 2022), only require secondary mental health assessments as necessary rather than on a mandatory basis and have high rates of patient satisfaction (Spanos *et al.*, 2021). The World Professional Association of Transgender Health's *Standards of Care Version 8* (*SoC8*) contains a chapter on non-binary genders and recommends that healthcare professionals will "benefit from avoiding assumptions about how each client conceptualizes their gender and by being prepared to be led by a given client's personal understanding of gender as it related to the client's gender identity, expression, and any need for medical care" (Coleman *et al.*, 2022, p. S81).

Understanding and supporting non-binary patients may require negotiation of the socio-culturally entrenched notions of certain bodies or body parts as binary gendered. Shifting away from understanding testosterone as only ever tied to masculinity and manhood and estradiol to femininity and womanhood, is vital to understanding non-binary negotiations of GAHT (Bolton, 2019). Likewise, body characteristics gained, removed, or altered through GAS can be similarly regarded. Moreover, rather than desire for markers of masculinity/manhood or femininity/womanhood, some non-binary people use GAHT and GAS to move away from their presumed sex at birth, and some desire to become visibly gender non-conforming or androgynous (Schulz, 2012). Healthcare professionals should explore all available options with non-binary patients to ensure they are able to access tailored and safe means of medical affirmation.

Limitations

There are inherent limitations in this cross-sectional study with participants recruited online using a non-probability snowball

sampling method. The sample is relatively young (median age 28 years, IQR 23,34), with few (1.1%) Indigenous respondents, which limits the generalizability of the findings. The ambiguity of the fixed-options responses 'taking steps to start GAHT/GAS' (categorized as unmet need) and 'thinking about if GAHT/GAS is right for me' may have led to under-reporting of unmet need for GAHT/GAS and over-reporting of 'thinking about' these types of medical gender affirmation. Further, for GAHT, for those respondents who indicated previous but not current use of GAHT (categorized in this study as met need), no distinction was made between individuals who wanted to recommence GAHT and those who did not want or were unsure if they wanted to recommence GAHT. Additionally, this study did not account for unmet need for multiple or additional types of GAHT/GAS, such as in individuals who have had one GAS but want one or more other types of GAS. These limitations may have led to an under-reporting of unmet need for both GAHT and GAS.

Consistent with previous non-binary samples (Callander *et al.*, 2019; Veale *et al.*, 2019), there was significantly more respondents PFAB compared to PMAB, highlighting the need for further research into the experiences of non-binary people PMAB. Sociodemographic characteristics such as education, employment, and regional or remote location, may impact access to gender-affirming healthcare, however, these were not ascertained. Extrapolation of findings to non-binary populations in other countries should also be approached with caution, given that differences in healthcare systems may have a significant impact on accessibility of gender-affirming care.

Conclusion

Non-binary people seek medical gender affirmation in varied and individual ways, including lower dose GAHT options and different GAS variations. As a result, there is a pressing need to improve

access to information about different options for gender-affirmation, both for non-binary people to make informed decisions and to better educate healthcare professionals on the diversity of medical affirmation pathways. Increased awareness about the variety of options will enable practitioners to provide good quality, patient-centered care to improve psychological functioning and quality of life for non-binary people.

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Authors' contributions

Conceptualization: SZ, AG, AWFQ, and ASC; Methodology: SZ, AG, AWFQ, and ASC; Data Curation: SZ; Investigation: SZ, AG, AWFQ, and ASC; Formal analysis: SZ, TR, SS, and AG; Writing—Original Draft Preparation: SZ, TR, SS, JM and JG; Writing—Review & Editing SZ, TR, SS, JM, JG, AG, AWFQ, and ASC; Funding Acquisition: ASC; Supervision: ASC. All authors had full access to all data (including statistical reports and tables) in the study, approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Disclosure statement

The authors report there are no competing interests to declare.

Data sharing statement

Deidentified participant data are available upon reasonable request from the corresponding author *via* adac@unimelb.edu.au, provided that the related research is deemed to be of benefit to the trans and gender diverse community and has undergone Austin Health Human Research Ethics Committee approval in the form of an amendment.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standard.

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Table 1. Demographic characteristics of the non-binary sample.

Demographic Variable	N	%
Age (years) ($N = 268$)		
16–25	106	39.6
26–35	111	41.4
36–45	35	13.1
46–55	12	4.5
56+	4	1.5
Sex presumed at birth ($N = 271$)		
Female	218	80.4
Male	53	19.6
Variation of sex characteristics (Intersex) ($N = 271$)		
No	227	83.8
Yes	3	1.1
Unsure	40	14.8
Prefer not to say	1	0.4
Aboriginal or Torres Strait Islander ($N = 271$)		
Aboriginal	3	1.1
Torres Strait Islander	0	0.0
Aboriginal and Torres Strait Islander	0	0.0
Non-Indigenous	262	96.7
Unsure	5	1.8
Prefer not to say	1	0.4
Australian state or territory ($N = 271$)		
Australian Capital Territory	11	4.1
New South Wales	66	24.4
Northern Territory	4	1.5
Queensland	32	11.8
South Australia	16	5.9
Tasmania	6	2.2
Victoria	106	39.1
Western Australia	30	11.1

Table 2. History and interest in medical gender affirmation.

Affirmation Variable	PFAB N (%)	PMAB N (%)	Total sample N (%)
History/Interest in GAHT (*N* = 270)			
Currently using GAHT	106 (48.8)	31 (58.5)	137 (50.7)
Previously but not currently using GAHT	19 (8.8)	4 (7.5)	23 (8.5)
Taking steps to commence GAHT	12 (5.5)	6 (11.3)	18 (6.7)
Thinking about whether GAHT is right for them	46 (21.2)	9 (17.0)	55 (20.4)
No interest in GAHT	33 (15.2)	3 (5.7)	36 (13.3)
Type of GAHT (*N* = 271)*			
Testosterone	105 (48.2)	0 (0.0)	105 (38.7)
Estrogen	1 (0.5)	30 (56.6)	31 (11.4)
Anti-Androgens (testosterone blockers)	0 (0.0)	20 (37.7)	20 (7.4)
Progesterone	0 (0.0)	8 (15.1)	8 (3.0)
Puberty blockers	0 (0.0)	0 (0.0)	0 (0.0)
Other (e.g. Performance enhancers)	3 (1.4)	0 (0.0)	3 (1.1)
History/Interest in GAS (*N* = 267)			
Had one or more GAS	64 (29.9)	3 (5.7)	67 (25.1)
Taking steps to have GAS	49 (22.9)	14 (26.4)	63 (23.6)
Thinking about whether GAS is right for them	64 (29.9)	25 (47.2)	89 (33.3)

No interest in GAS	37 (17.3)	11 (20.8)	48 (18.0)
Type of surgery ($N = 271$)*			
Body feminization	0 (0.0)	0 (0.0)	0 (0.0)
Body masculinization	0 (0.0)	0 (0.0)	0 (0.0)
Breast augmentation	0 (0.0)	0 (0.0)	0 (0.0)
Breast reduction	1 (0.5)	0 (0.0)	1 (0.4)
Double mastectomy	60 (27.5)	0 (0.0)	60 (22.1)
Facial feminization	0 (0.0)	0 (0.0)	0 (0.0)
Facial masculinization	0 (0.0)	0 (0.0)	0 (0.0)
Hysterectomy	7 (3.2)	0 (0.0)	7 (2.6)
Metoidioplasty	0 (0.0)	0 (0.0)	0 (0.0)
Oophorectomy	4 (1.8)	0 (0.0)	4 (1.5)
Orchiectomy	0 (0.0)	2 (3.8)	2 (0.7)
Phalloplasty	0 (0.0)	0 (0.0)	0 (0.0)
Tracheal shave	0 (0.0)	0 (0.0)	0 (0.0)
Vaginoplasty	0 (0.0)	1 (1.9)	1 (0.4)
Voice surgery	0 (0.0)	0 (0.0)	0 (0.0)
Other	1 (0.5)	1 (1.9)	2 (0.7)
History/interest in GAHT and/or GAS ($N = 266$)			
Have or want both GAHT and GAS	102 (47.9)	15 (28.3)	117 (44.0)
Have or want GAHT, considering GAS	27 (12.7)	20 (37.7)	47 (17.7)
Have or want GAHT, no interest in GAS	9 (4.2)	6 (11.3)	15 (5.6)
Considering GAHT, have or	4 (1.9)	1 (1.9)	5 (1.9)

want GAS			
Considering GAHT, considering GAS	29 (13.6)	5 (9.4)	34 (12.8)
Considering GAHT, no interest in GAS	10 (4.7)	3 (5.7)	13 (4.9)
No interest in GAHT, have or want GAS	6 (2.8)	1 (1.9)	7 (2.6)
No interest in GAHT, considering GAS	8 (3.8)	0 (0.0)	8 (3.0)
No interest in GAHT, no interest in GAS	18 (8.5)	2 (3.8)	20 (7.5)

PFAB – presumed female at birth; PMAB – presumed male at birth; GAHT – gender-affirming hormone therapy; GAS – gender-affirming surgery; 'Unsure' and 'prefer not to say' responses not included;

*Multiple responses allowed for this question so total responses do not sum to 100%.

Table 3. Met and unmet need for medical gender affirmation.

Affirmation Variable	PFAB N (%)	PMAB N (%)	Total sample N (%)
Need for GAHT (*N* = 178)			
Met need (have ever used GAHT)	125 (91.2)	35 (85.4)	160 (89.9)
Unmet need (taking steps to commence GAHT)	12 (8.8)	6 (14.6)	18 (10.1)
Need for GAS (*N* = 130)			
Met need (have had one or more GAS)	64 (56.6)	3 (17.6)	67 (51.5)
Unmet need (taking steps to have GAS)	49 (43.4)	14 (82.4)	63 (48.5)

PFAB – presumed female at birth; PMAB – presumed male at birth; GAHT – gender-affirming hormone therapy; GAS – gender-affirming surgery.